KULVIR JAYDEEP CHAVDA

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SUMMARY

I am an Aerospace Engineering student and pilot-in-training whose curiosity about the unknown has grown into hands-on research in robotics and controls. At Illinois, I work on and aim to continue developing autonomy and flight systems for drones and multi-robot platforms in GPS-denied environments, combining technical rigor with field testing. My goal is to advance robotics that expand humanity's reach in space and eventually take those systems off planet myself as an astronaut.

EDUCATION

University of Illinois at Urbana-Champaign **Champaign, IL**
Bachelors of Science in Aerospace Engineering ***Graduation:*** *May 2026*
Minor: *Computer Science*
Honors Standing: *James Scholar Honors*
GPA: *3.83/4.00*
Relevant Coursework: Aerospace Numerical Methods; Control Systems; Dynamical Systems; Flight Mechanics & Aircraft Flight Mechanics; Incompressible & Compressible Flow; Aerospace & Applied Structures; Systems Design I (in progress); Aerodynamics & Propulsion Lab (in progress); Autonomous Systems Lab (in progress); Independent Study in Robotics & Controls (in progress); Thermodynamics; Engineering Materials; Linear Algebra & Differential Equations; Applied Machine Learning; Data Structures; Data Visualization; Electrical & Electronic Circuits.

Parkland College Institute of Aviation **Savoy, IL**
FAA-Approved Private Pilot Certification, Institute of Aviation (Part 141 Program) ***Graduation:*** *May 2026*
Enrolled in ground school covering aerodynamics, navigation, regulations, and weather, alongside flight training in single-engine aircraft. The program combines classroom instruction, simulator practice, and supervised flight hours as part of the requirements for the FAA Private Pilot Certificate.

SKILLS

Programming & Software: Python, C/C++, MATLAB, Simulink, ROS2, Linux/Unix, Java, Arduino, HTML/CSS/JS.
***Robotics & Controls*:** SLAM and state estimation, multi-robot coordination, LQR/PID/robust control, autonomy stack integration, motion-capture (Qualisys), log analysis.
Aerospace & Simulation: FreeFlyer (Orbital Mechanics), OpenRocket, BurnSim, CFD & FEA fundamentals.
CAD & Fabrication: SolidWorks, Siemens NX, Fusion 360, CATIA, 3D printing, prototyping.
Electronics & Avionics: Eagle EDA, Proteus V8, soldering, wiring harnesses, avionics integration.
Data & Visualization: Applied Machine Learning, Data Structures (CS 225), Data Visualization (CS 416), linear algebra & numerical methods.

RESEARCH EXPERIENCE

Nonlinear Autonomous Control, Exploration, Intelligence, and Systems (N-ACXIS) Lab, UIUC **Urbana, IL**
Undergraduate Researcher – GNC, Autonomous/Embedded Systems, & Test Design *November 2024 - Present*
Advisor: Dr. Hiroyasu Tsukamoto

- Develop 3 real-time experiments to validate 3D Guidance, Navigation and Control (GNC) algorithms, integrated with machine learning, for swarms of heterogeneous UAVs navigating unmapped, GPS-denied environments.
- Implement ROS2/Python based autonomy stack integrating SLAM, multi-agent coordination, and robust obstacle avoidance on 3+ UAVs & Ground based robots.
- Utilize the Qualisys Motion Capture System & On-board SLAM in robots at the UIUC drone research lab.
- Learn to simulate and optimize nonlinear flight dynamics using LQR, PID, and other control techniques in Python.
- Design and execute full experimental pipeline from control law modeling to log analysis and performance evaluation.
- Preparing weekly technical presentations to keep Dr. Tsukamoto updated on progress and further plans.

Department of Aerospace Engineering at UIUC, Independent Research **Urbana, IL**
Undergraduate Researcher & First Author – Numerical Methods & Data Analysis *May 2023 - May 2024*
Advisor: Heather Arnett (Dr. Joshua L. Rovey as a secondary advisor)

- Utilized rocket flight data (24 flights), thrust tests, & Python to write an algorithm that predicts accurate rocket trajectories.
- Conducted 25+ solid rocket-motor thrust tests to create accurate theoretical thrust curves to plug into python algorithms.
- Designed the algorithm structure and developed a Python application with a GUI (Graphical User Interface) to take user input and output graphs depicting altitude vs. time and drag force vs. time for the model rocket, both with/without drag.
- Gained approval from the university to submit an abstract to the 2024 AIAA Region III Conference, and got accepted.
- Wrote a paper and polished it over 6 months with advice from Heather Arnett (STEM Advisor) and my professors.
- Prepared detailed schematics and visuals for my conference presentation and delivered a 30-minute talk on the same.

Laboratory of Advanced Space Systems at Illinois **Urbana, IL**
Undergraduate Research Student (ENG 491 – Nanosatellite Design Build I) *January 2024 - May 2024*
Professor: Dr. Michael Lembeck

- Trained/Certified to use 3D printers, thermal vac chamber, solar simulator, soldering machines, and other lab equipment.
- Assisted in the foundational design & development of a zero-gravity chemical-electrospray propellant dual-feed system.
- Accounted for material and instrumentation requirements to prepare a list of parts for the dual-feed system within 2 weeks and spearhead initial cost analysis.
- Prepared detailed engineering requirement documentation by working closely with PhD students and fellow undergrads.

PUBLICATIONS & PRESENTATIONS

Publications: Chavda, K. J., Arnett, H. R. (2024). Using the Drag Equation and Euler's Method in Python to Predict Model Rocket Flight Trajectories. AIAA Region III Student Conference 2024, Akron, OH. Paper ID: AIAA 2024-84150. DOI: 10.2514/6.2024-84150

Conference Presentations: As an undergraduate researcher, I have presented technical findings at regional conferences and student competitions, gaining experience in oral delivery, Q&A sessions with faculty, and communicating research to both technical and general audiences.

Posters & Internal Discussions: I regularly shared progress in lab meetings and project reviews, from weekly N-ACXIS updates to independent study pitches. These talks gave me experience explaining complex aerospace and robotics concepts clearly and receiving constructive feedback from faculty and peers.

Events & Outreach Presentations: I presented aerospace projects to sponsors, securing over $2,500 in funding, and led outreach sessions through the DoD-funded NDEP program that introduced 150+ teachers and students to rocketry and avionics. These experiences strengthened my ability to connect technical work with broader audiences and inspire interest in exploration.

TEACHING EXPERIENCE

Department of Aerospace Engineering at the University of Illinois **Urbana, IL**
Aerospace Educational Development and Outreach Mentor *April 2023 - May 2024*

- Selected from a pool of over 20 undergraduate students who applied to work under the Aerospace engineering department's NDEP (National Defense Education Program) DoD grant.
- Mentored 15+ STEM teachers & 50+ students on the fundamentals of rocket science through hands-on workshops using 150+ rockets, custom avionics, and an intricately planned series of lectures.
- Guided students in building and analyzing rocket systems, forming a well-informed hypothesis, planning test flights, collecting flight data, and deriving design-performance insights.
- Identified and implemented course improvements through detailed surveys that improved course structure & effectiveness to expand the program into more Illinois classrooms.

iFly Indoor Skydiving Robotics Competition, Minorities in Aerospace **Urbana, IL**
Student Engineering Mentor *November 2022 - December 2022*

- Selected after two rounds of interviews to assist as an engineering mentor to 5+ middle school and high school students from Wolcott College Prep, Chicago.
- Conducted weekly meetings with students to develop a spherical flapping robot to oscillate in a skydiving chamber.
- Utilized tools & parts supplied from Wolcott to build and iterate on a physical protype that would be shipped to iFly.

- Achieved our goal of having the robot oscillate up and down in an indoor skydiving chamber by using retractable wings.

COSMOLOGICAL (Personal Project) **Ahmedabad, India**
Founder, Writer, and Site Administrator (www.cosmological.in) *January 2019 - Present*
- Fell in love with physics and space exploration by the time I reached middle school.
- Heard about the Feynman Method of learning and created a WordPress blog to spread my love for space.
- Over the course of a few years, started taking on more challenging topics and customized by blog into a website where discussions could take place.

PROJECT EXPERIENCE

Minorities in Aerospace (MAero UIUC), University of Illinois **Urbana, IL**
Head of Technical Projects *January 2023 - Present*
- Plan, advise, and recruit engineering students for any technical initiatives undertaken by MAero.
- Lead 3 technical project teams: High-altitude sounding rocket, Sustainable student-built airplane, and a Fully 3D-printed modular autonomous drone.
- Coordinate and oversee system requirements, budgeting, prototyping, and timeline planning across multidisciplinary teams of over 20 students.
- Secured $2,500+ in funding from Blue Origin and organized aerospace research events featuring 5+ UIUC faculty.

Department of Defense S.T.E.M. Vertically Landed Rocket Challenge **Bloomington, IL**
Project Systems Engineer – Systems Optimization & Prototyping *August 2023 - November 2023*
- Volunteered and assembled a team of 6 engineering students, over a month, to represent the University of Illinois at the Department of Defense VLR Challenge.
- Built & optimized a dual-servo system enabling a solid-fueled lander to reorient and land on descent after being dropped from a height of 30 meters.
- Programmed and tuned onboard avionics to control burn timing, burn orientation, and collect inertial and altimetric data across 5 test flights.
- Utilized simulation and test data to refine system parameters and improve stability margins by 40% across test iterations.

L1 Altitude Model Rocket Build **Urbana, IL**
Designer, Engineer, and Fabricator *August 2023 - December 2023*
- Participated in an extracurricular rocketry course offering from a student organization to attempt to build my own H/I-class model rocket to apply for a L-1 Rocketry Certification.
- Designed over the course of 4 months to cross an altitude target 2000ft and utilized manufacturing techniques like 3D-printing and laser cutting to complete the prototype.
- Was successfully launched by a group of certified students and exceeded expectations by over 500ft.

International Planetary Aerial Systems Challenge, Mars Society South Asia **Ahmedabad, India**
Avionics Team Lead & Engineer *March 2021 - June 2021*
- Designed a theoretical prototype for an unmanned aerial vehicle capable of carrying out man-assisted missions on Mars.
- Led the Avionics/GNC sub-team of 14 graduate/undergraduate students to develop custom electronics, system architecture, algorithm flowcharts, and programs required for the system.
- Facilitated full team meetings (50+ graduate & undergraduate students), as the youngest sub-system lead, to make sure all sub-systems maintain a good line of communication and minimize technical misunderstandings.
- Simulated functioning of mission avionics using industry-tested software and reduced avionics weight by 20%.
- Developed and prepared documentation on a grid-based terrain-hugging navigation system using Martian data from NASA within 2 weeks to minimize risk of crashes.
- Wrote, edited, and verified the avionics and GNC section of our engineering design report over 3 months with my team.

WORK EXPERIENCE

Stratos Aircraft, Inc. **Redmond, OR**
Aerospace Engineering Intern – Flight Controls & Structural Systems *May 2025 - August 2025*
- Assisted with mechanical design, drafting, and manufacturing of flight control systems, landing gear, and other critical onboard subsystems.

- Collaborated directly with welders, machinists, and technicians to align engineering intent with shopfloor capabilities, streamlining fabrication and reducing iteration cycles.
- Drafted and revised over 100 engineering parts and assembly drawings, ensuring adherence to FAA certification guidelines and internal engineering standards.
- Gained practical exposure to FAA certification processes and mechanical airworthiness through firsthand involvement in design compliance efforts.
- Integrated feedback from structural engineering reviews, incorporating FEA and test/simulation-based design changes to enhance system robustness.
- Took full ownership of 4-6 mechanical design, DFM, or drafting projects per week; communicated progress and questions in weekly team meetings with senior engineers and leadership.

Adani Defense & Aerospace **Ahmedabad, India**
Aerospace Engineering Research & Development Intern *June 2024 - August 2024*
Project: Short Range Missile Development for Counter Drone Systems

- Conducted foundational research and design to give proof-of-concept to a novel short-range missile system.
- Generated 50+ detailed system and design requirements to support a complete concept-to-prototype development cycle.
- Conceptualized 3 engineering design variants, with CAD, for within 2 weeks to kickstart project development.
- Designed vehicle trajectory manually and modelled it using Python to design appropriate control systems for the vehicle.
- Modeled and optimized propulsive/aerodynamic forces; conducted 3 trade studies on structural integrity under loading.
- Led weekly PFMEA sessions to identify design risks and reduced estimated manufacturing time by up to 50%.
- Authored a 40-page engineering report presenting modeling, design analysis, trade-offs, and development roadmap.

Space Technology and Aeronautical Rocketry (S.T.A.R.) **Ahmedabad, India**
Avionics Engineering Intern *January 2021 - February 2021*

- Trained to use industry-tested software for rocketry, avionics, and systems analysis for use during the internship.
- Led the 6-person team assigned to avionics subsystems to design and write engineering design reports on a 'Static Solid Rocket Motor Test Pad' and a 'High Powered Rocket'. Each 30-page technical report included full design specifications.
- Presented technical and sales pitches for each system to company leadership. We secured approval on the first attempt.
- Networked with over 20 talented individuals from across India that led to forming, and leading, a team for the Mars Society South Asia – International Planetary Aerial Systems Challenge in March of 2021.

HONORS AND AWARDS

- AIAA Region III Student Conference 2024 – 3rd Place Winner, Undergraduate Category
- Dean's List, Grainger College of Engineering (Fall 2024) – Junior-year 1st semester; GPA: 4.00
- James Scholar Honors, University of Illinois at Urbana-Champaign (Inducted in 2024)
- Blue Origin RSO Funding Award – $2,500 (March, 2023)
- Mars Society South Asia, International Planetary Aerial Systems Challenge – 4th Place of 26 teams (2021)

REFERENCES

Carsten Sundin
- **Role:** Chief Executive Officer – Stratos Aircraft, Inc.
- **Contact:** Email: csundin@stratosaircraft.com, Office Phone: +1 716-237-8434

Dr. Hiroyasu Tsukamoto
- **Role:** Lead Researcher & Supervisor – N-ACXIS Lab at the University of Illinois Urbana-Champaign
- **Contact:** Email: hiroyasu@illinois.edu

Heather Arnett
- **Role:** Supervised 1st Publication; STEM Coordinator at the University of Illinois Urbana-Champaign
- **Contact:** Email: hrb2@illinois.edu